Textile Strain Gauge for Inflatable Structures

Completed Technology Project (2012 - 2012)

Project Introduction

One of the important elements of an inflatable structure is the restraint layer, made of textile straps that are woven together. This provides the structural support for the article and reacts with the internal pressure load. For this layer to maintain its strength, stiffness and safety margins under pressure, it is critical for designers and analysts to understand how the load varies within each strap. Current technology only permits the strap load to be measured by using a strain gauge attached to a metal clevis that connects the strap to the bulkhead on either end. The loading throughout the strap, however, is not linear and varies throughout the strap's length. Because the strain gauges have to be installed on metal at one location, they are unable to measure load variation within the straps. The proposal is to develop a textile strain gauge that can be used at various locations on the straps to measure strain as the straps are loaded.

The project was completed via a multi-division collaboration within JSC and university partnerships. A number of device concepts were developed and tested that utilize a conductive material directly embedded/adhered to the restraint layer strap. The material has a natural electrical resistance, and as it is stretched (along with the strap) the resistance in the device will change. This resistance change can be monitored and correlated to a change in the strap load.

Anticipated Benefits

An on-orbit monitoring system using this techonology can be implemented into the restraint layer of the Bigelow Expandable Activity Module (BEAM) set to be berthed with the ISS in 2015.

Project Image Textile Strain Gauge for Inflatable Structures

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Center Innovation Fund: JSC CIF

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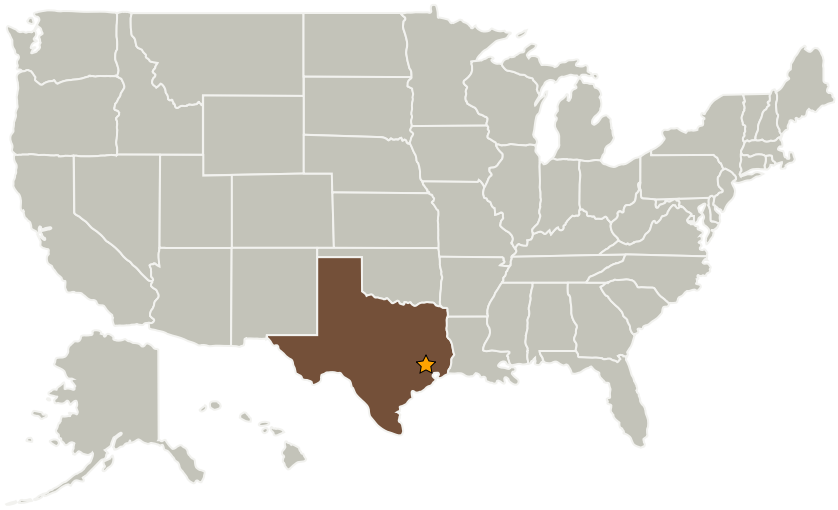
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations
Texas

Images

12432-1376495795272.png
Project Image Textile Strain Gauge for Inflatable Structures
(https://techport.nasa.gov/image/2213)

Project Management

Program Director:
Michael R Lapointe

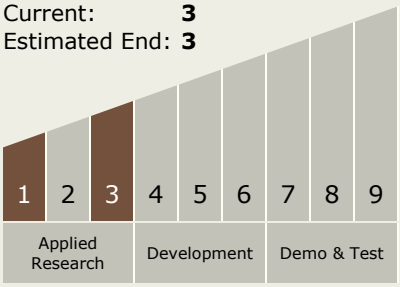
Program Manager:
Carlos H Westhelle

Project Manager:
Douglas A Litteken

Principal Investigator:
Douglas A Litteken

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.7 Computational Fluid Dynamics (CFD) Technologies